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ABSTRACT

Data on the characteristics of 400 Wisconsin dairy farmers by adopter category innovator-early adopter and early majority; early majority and late majority; and late majority and laggard) are compared with the characteristics of 200 Ohio farmers studied in 1961. The data on the Wisconsin dairy farmers were obtained/by personal interview in a 1962 state-wide random sample of all commercial farmers who were married and under age 65. The Ohio survey differed as to some of the selection criteria. Innovativeness was measured by the number of 10 improved farm management practices ever used. "F" ratios were computed between the adopter categories in the Wisconsin study, and in order to make comparable analysis of the Ohio data, estimates of the statistical variance were made and "t" scores computed. Two major exceptions that occurred between the results of the Ohio study and the Wisconsin study were: (1) enterprise specialization was positively associated with innovativeness in the Ohio study, but negatively associated in the Wisconsin study; and (2) in the Ohio study, those in the early adopter category had greater county Extension contact than those in the innovator category, the difference being statistically significant, whereas the innovators in the Wisconsin study had an average of 11.9 personal visits with Extension agents the preceding year compared with 6.5 visits for early adopters. Data in both studies were also analyzed as to whether the various characteristics differentiated at early adoption, middle adoption, or late adoption levels to the same extent. Tables provide the study data. (DB)

CHARACTERISTICS OF WISCONSIN DAIRY OPERATORS BY ADOPTER CATEGORY: IS ROGERS CORRECT?

by

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(Paper presented at the Rural Sociological Society annual meeting, Baton Rouge, Louisiana, August 26, 1972)

Introduction

Everett M. Rogers has popularized the well known five categories of innovators, early adopters, early majority, late majority and laggards. Two chapters of his 1962 book, Diffusion of Innovations, were devoted to adopter categories.[1] These chapters were entitled "Adopter Categories" and "Innovator as Deviants: In Step with a Different Drummer." In his 1971 revision of the book with F. Floyd Shoemaker one chapter was devoted to this topic.[2] The dropping of the separate chapter on innovators in the more recent book indicates less emphasis upon terming innovators deviant. Certainly the empirical evidence is lacking to indicate agricultural innovators are considered deviants in terms of local community norms, at least, in modern societies.

While many researchers have related innovativeness, or more precisely level of use of technology, to characteristics of farmers, relatively few investigations have been made of the characteristics of farmers by the five adopter categories outlined by Rogers. The primary report of characteristics of farmers by adopter category is an Ohio Agricultural Experiment Station bulletin by Rogers.[3]

In the present paper, data on the characteristics of 400 Wisconsin dairy farmers by adopter category are compared to the characteristics of 200 Ohio farmers studied by Rogers. The Ohio study was based on data collected from a 1957 statewide random sample of 104 commercial farmers and a supplemental sample of 96

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[1]Everett M. Rogers, Diffusion of Innovations. New York: The Free Press of Glencoe, 1962.

[2]Everett M. Rogers and F. Floyd Shoemaker, Communication of Innovations. New York: The Free Press, 1971.

[3]Everett M. Rogers, Characteristics of Agricultural Innovators and Other Adopter Categories. Wooster: Ohio Agricultural Experiment Station Research Bulletin 882, May, 1961.

innovators. The latter farmers were surveyed by mail questionnaire and were nominated by 44 county Extension agents. Only data on those farmers who had adoption scores at the innovator level in the statewide sample were included in the supplemental sample. While several biases were present because of the two procedures in selection of farmers in the Ohio study, the primary bias may be that many of the farmers nominated were "super innovators." While all of the farmers were clearly in the innovator category, the sample may not have been fully representative of all innovators.

The data on the 400 Wisconsin dairy farmers were obtained in a 1962 statewide random sample of all commercial farmers. Data were gathered by personal interview. Some differences in the criteria for selection of farmers in the two studies may have affected the results. For instance, the Wisconsin study was limited to married men who were under age 65 while the Ohio survey was not. In addition, only farmers who raised dairy cattle and grew corn were included in the Wisconsin analysis; the procedure lowered the number of farmers studied from 473 to 400.

Some differences existed in the way innovativeness was measured in the two studies. Rogers measured innovativeness by the use of "sten" or "standardized" scores based on the time of first use of 25 improved farm practices. An average score was obtained for the pratices applicable to the farm operation. The number of applicable practices was often quite a bit fewer than 25 practices. The number of farmers by adopter category was 3, 14, 35, 35 and 17 for the sample of 104 farmers. Data on the supplemental sample of 96 innovators were added to that of the three innovators.

Innovativeness in the Wisconsin study was measured by the number of 10 improved farm management practices ever used.[4] All 10 practices were applicable to all farmers studied. Three practices were dairy practices, two were corn practices and five were general farm practices. In both studies only practices which were recommended by the Agricultural Experiment Station and Extension Service were included. The average number of the 10 practices ever tried in the Wisconsin study was 5.6 practices. The distribution of the number of practices ever tried allowed for a fairly close fit to the number of farmers in the five adopter categories indicated by Rogers. The resulting number of farmers by adopter category was 10, 77, 134, 118 and 61, respectively, from innovators to laggards. The number of innovators was exactly 2.5 percent and the number of laggards was very close to the theoretical 16.0 percent figure. The number of the 10 practices ever tried by adopter category was 10, 8 or 9, 6 or 7, 4 or 5 and 3 or less, respectively, from innovators to laggards.

Measurement of the independent variables or characteristics in the two studies was similar. Although adoption or opinion leadership was assessed by fewer questions in the Wisconsin study, the questions used were nearly identical to those used in the Ohio study. Opinion leadership in both studies was based on the self-designation of the farmers. The score assessing Extension contact in the Ohio study included both personal and impersonal contact, whereas in the Wisconsin study the score was limited to only personal contact.

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[4]Frank O. Leuthold, "Discontinuance of Improved Farm Innovations by Wisconsin Farm Operators." Madison: University of Wisconsin, unpublished Ph.D. dissertation, 1967.

Analysis of Data

Data are reported on farmers' characteristics by adopter category. The averages of several characteristics by farmers in each adopter category are shown in Tables 1 and 2. In the Wisconsin study, "F" ratios were computed between the following adjacent adopter categories: 1) innovator-early adopter and early majority, 2) early majority and late majority, and 3) late majority and laggard. The "F" ratios and the rank of these for 10 characteristics are shown in Table 3. By the use of this procedure it was possible to determine whether the various characteristics differentiated farmers to the same extent at early, middle and late levels of adoption of practices. For example, there was a statistically significant difference in age between farmers in the early majority and late majority categories, but not between farmers in the late majority and laggard categories.

In order to make comparable analysis of the Ohio data, estimates of the statistical variance were made and "t" scores computed. Knowledge of actual variances of the Wisconsin data helped in the estimation of variances. The "F" ratio is the square of the "t" score. If even a very high estimate of variance produced a statistically significant difference at the .05 level of probability, the difference was indicated as being "significant" (Table 4). On the other hand, if a low estimate of variance did not produce a statistically significant difference, it was indicated as "nonsignificant." Only four of the 30 differences were felt to fall in an intermediate level. The rank order of the "F" ratios, as shown in Table 4, was based upon computations of a reasonable estimate of variance. While, of course, it is unknown how accurate the results are, it is felt that the rankings are reliable within two rank orders. The smaller sample size of the Ohio study was the primary reason for fewer of the differences to be statistically significant than in the Wisconsin study. Of the 30 comparisons, 11 were estimated to be significant, 15 nonsignificant and four were intermediate.

Table 1. Summary of the Characteristics of 400 Wisconsin Dairy Farmers by Adopter Category Based Upon Trial Use of 10 Improved Farm Management Practices

Characteristic	Adopter Category[a] Innovator (N-10)	Early Adopter (N-77)	Early Majority (N-134)	Late Majority (N-118)	Laggard (N-61)	Combinations Which Are Not Stat. Sign.[b]
	average					
1. Gross farm income (thou. dollars)	22.6	15.6	11.4	9.7	6.7	All sign.
2. Opinion lead. score (range 0-17)	14.1	13.0	11.7	9.9	8.7	1,10
3. Agric. specialist contact (percent)	70.0	61.0	36.6	19.5	6.6	1
4. Agricultural training (years)	6.6	5.2	3.2	1.7	0.8	1
5. Personal county agent contact (no. per yr.)	11.9	6.5	2.3	1.4	0.8	1,8,10
6. Milk production (thou. lbs./cow)	11.0	10.0	9.3	8.7	8.0	1
7. PMU's for farm	509.0	400.8	349.3	316.7	263.3	1
8. Formal organ. membership (0-5)	3.5	3.0	2.3	1.9	1.6	1,10
9. Education (years)	11.4	10.4	9.6	8.8	8.3	1,10
10. No. farm magazines (range 0-5)	3.3	3.2	2.9	2.6	2.0	1,2,3,5
11. Enterprise specialization (percent)	67.6	72.7	74.8	76.3	78.1	1,2,5,8,10
12. Age (years)	42.3	44.9	44.2	47.0	47.7	1,2,3,4,5, 6,7,10

[a]The number of farmers in the adopter categories varies some from the theoretical distribution of 2.5, 13.5, 34.0, 34.0 and 16 percent, respectively, indicated by Rogers. The number of practices ever tried by farmers was 10, 8-9, 6-7, 4-5 and 3 or less, respectively, in the adopter categories.

[b]Scores of the 12 variables were tested by the "F" ratio between all possible combinations between the five adopter categories. Since the number of combinations which were statistically significant at the .05 level of probability exceeded those which were not, only the nonsignificant combinations are indicated. The code numbers of the various combinations are as follows:

1 - Innovator and early adopter
2 - Innovator and early majority
3 - Innovator and late majority
4 - Innovator and laggard
5 - Early adopter and early majority
6 - Early adopter and late majority
7 - Early adopter and laggard
8 - Early majority and late majority
9 - Early majority and laggard
10 - Late majority and laggard

Table 2. Summary of the Characteristics of 200 Ohio Farmers by Adopter Category Based Upon Time of Use of 25 Farm Practices[a]

Characteristic	Adopter Category				
	Innovator (N-99)	Early Adopters (N-14)	Early Majority (N-35)	Late Majority (N-35)	Laggards (N-17)
	average				
1. Gross farm income (thou. dollars)	--	15.9[b]	8.7	4.9	4.2
2. Adoption leadership (score)	--	6.5[b]	5.7	5.7	3.3
3. Agric. specialist contact (percent)	42.0	14.3	17.1	5.7	0.0
4. Extension contact (score)	2.7	3.6	2.6	2.3	1.4
5. PMWU's of farm	614	503	270	222	159
6. Formal organization membership	8.8	5.5	4.1	3.0	1.7
7. Education (years)	12.6	11.8	10.6	8.9	8.6
8. Enterprise specialization (percent)	54.3	53.9	48.5	39.7	42.9
9. No. of farm magazines	3.9	3.4	3.2	2.9	2.5
10. Age (years)	--	37.6[b]	40.8	43.7	54.7

[a]Source: Everett M. Rogers, Characteristics of Agricultural Innovators and Other Adopter Categories. Columbus: Ohio Agricultural Experiment Station, Research Bulletin 882. May, 1961.

[b]The three farmers in the sample of 104 farmers who were classified as innovators were included in the average of early adopters where information on the variable wasn't included in the supplement sample of 96 innovators.

In both studies, coefficients of correlation are reported between adoption scores and the independent variables. In the Ohio study coefficients were computed on the sample of 104 farmers.

Findings

In the Wisconsin study, farmers in the innovator category had greater gross farm income, opinion leadership, agricultural specialist contact, milk production per cow, PMWU's, formal organizational membership, and received more farm magazines than those in any other adopter category (Table 1). Those in each subsequent adopter category were lower in each of these attributes than those in the earlier adopter category. The difference on gross farm income was statistically different between innovators and early adopters while the difference on county Extension agent contact just fell short of being significant at the .05 level of probability. Innovators were younger and had lower enterprise specialization than those in any other adopter category. The averages on these factors increased in later adopter categories although a small reversal occurred on average age between those in the early adopter and early majority categories.

In terms of the absolute differences, the largest variation occurred between innovators and early adopters than between any two other adjacent categories on gross farm income, county agent contact, PMWU's, milk production, educational attainment and enterprise specialization. Sizable differences occurred on formal organizational membership and years of agricultural training, such as vocational agriculture, 4-H training and agricultural college. Small differences between innovators and early adopters occurred for age, number of farm magazines received and opinion leadership.

In the Ohio study similar trends occurred (Table 2). Innovators had greater agricultural specialist contact, PMWU's, formal organizational membership, years

of education, enterprise specialization and received more farm magazines than those in any other adopter category. The averages on these variables decreased in each subsequent adopter category. Data on gross farm income, adoption leadership and age were not reported for the supplemental sample of innovators. The data on the 104 farmers showed the differences on the first two variables decreased consistently while age increased from the early adopter to laggard category.

A couple of major exceptions occurred between the results of the Ohio study and the Wisconsin study. First, enterprise specialization was positively associated with innovativeness in the Ohio study, but negatively associated in the Wisconsin study ($r = -.18$). The difference was at a statistically significant level in both instances. The fact Wisconsin is a highly specialized farming region may account for the negative association. While the earlier adopters had more dairy cows than later adopters in the Wisconsin study, they were more likely to have secondary enterprises. On the other hand, Ohio is a mixed farming area and sizable numbers of farmers have beef, swine, dairy and row crops as their major farm enterprises. The data from the Ohio study may indicate that in a mixed or diversified farming region innovativeness and degree of specialization are positively associated. In any case, the Wisconsin data fail to support the generalization by Rogers and Shoemaker that innovativeness and enterprise specilization are positively associated.

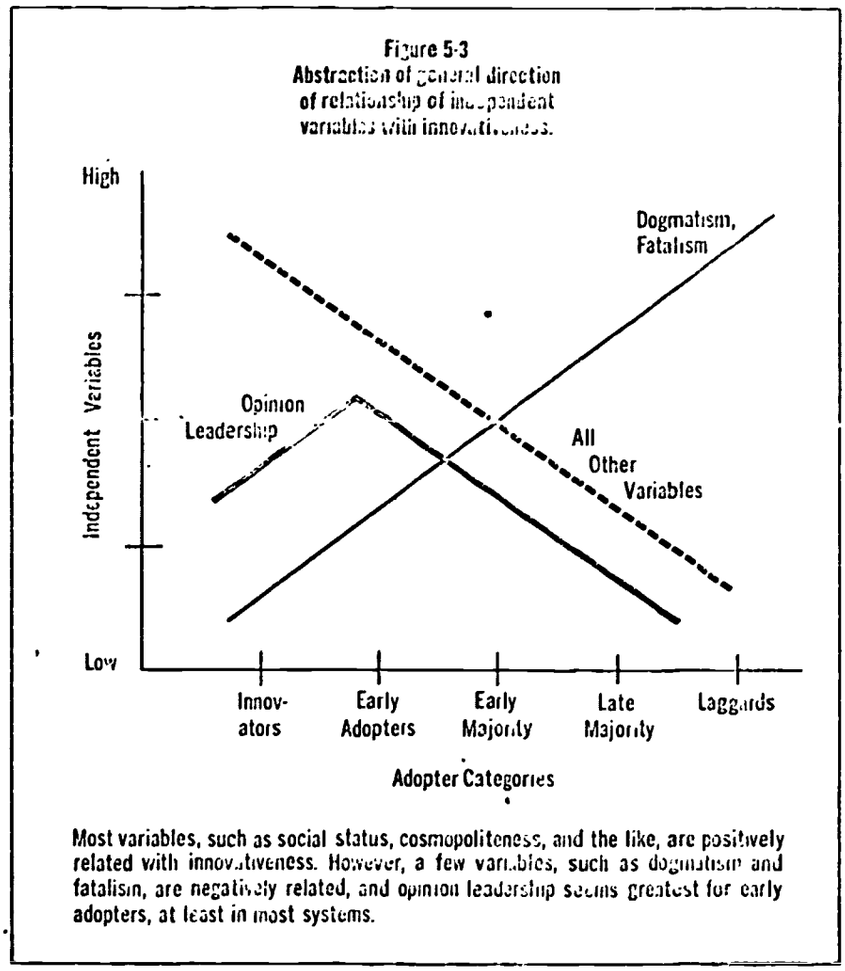
A second major exception in the findings in the two studies is that the level of contact with county Extension agents by innovators and early adopters was reversed. In the Ohio study, those in the early adopter category had greater county Extension contact than those in the innovator category. The difference was judged to be at a statistically significant level. The extent of contact decreased from the early adopter category to the laggard category in the Ohio study. Innovators had only slightly more contact than those in the early and late

majority categories. Innovators in the Wisconsin study had an average of 11.9 personal visits with county Extension agents the year preceding the survey compared to 6.5 visits for early adopters; the "F" ratio on this difference was just below the statistically significant level at the .05 level of probability. The average number of visits for those in the other adopter categories was 2.3, 1.4 and 0.8, respectively, from early majority to laggard. The differences on Extension contact for innovators and for early adopters and those in each of the other three categories were statistically significant.

Another central finding in the Wisconsin study was that innovators had higher opinion leadership in their community than early adopters or the opposite of what is hypothesized by Rogers and Shoemaker (Figure 1). Both innovators and early adopters had statistically greater opinion leadership than those in the early majority, late majority and laggard categories. While innovators had higher opinion leadership than early adopters, the difference was not statistically significant at the .05 level of probability. The innovators in the Ohio study reported they convinced peers to adopt an average of 2.14 new farm practices compared to 1.85 practices reported by early adopters; the difference was judged to be nonsignificant at the .05 level of probability. Although data from neither study support the hypothesis by Rogers and Shoemaker, the data are insufficient to reject the hypothesis. Somewhat surprising was the fact Rogers and Shoemaker cite no sources to support their hypothesis.

Data in both studies were also analyzed as to whether the various characteristics differentiated at early adoption, middle adoption or late adoption levels to the same extent. The adoption level where major differences occurred varied by characteristic in both studies (Tables 3 and 4). In the Ohio study, statistically significant differences between the early adopter and early majority categories occurred on gross farm income, PMU's and formal organizational membership.

Figure 1. Hypothesized Relationship of Opinion Leadership and Other Variables with Innovativeness as Indicated by Rogers and Shoemaker[a]



[a](Source) Everett M. Rogers and F. Floyd Shoemaker, Communication of Innovations. New York: The Free Press. 1971, p. 190.

Table 3. Summary of the Statistical Variation of 10 Characteristics of 400 Wisconsin Dairy Farmers by Adopter Category

Characteristics	Coef. of Corr. "r"[b]	"F" Ratio Between Adopter Categories: Inn.-Early Adopt.[a] and Early Maj. "F" Ratio	Rank of Ratios	Early Majority and [illegible]rity Ratio	Rank of Ratios	Late Majority and Laggard "F" Ratio	Rank of Ratios
1. Gross farm income (thou. dollars)	.42*	24.0*	2	4.5*	7	9.1*	2
2. Opinion leadership score (range 0-17)	.41*	9.2*	6	14.6*	1	3.5	6
3. Agric. specialist contact (percent)	.40*	13.7*	4	8.7*	3	5.3*	4
4. Agric. training (years)	.39*	10.3*	5	11.8*	2	4.9*	5
5. Personal county agent contact (no. per year)	.39*	29.7*	1	3.5	10	2.2	8
6. Milk production (thou. lbs./cow)	.37*	8.4*	7	7.4*	5	6.2*	3
7. Formal organ. membership (0-5)	.36*	18.9*	3	4.2*	9	2.7	7
8. Education (years)	.31*	6.9*	8	8.0*	4	1.4	9
9. No. farm mag. (range 0-5)	.31*	4.7*	9	4.3*	8	10.7*	1
10. Age (years)	-.13*	0.1	10	4.8*	6	0.2	10
Average "F" ratio	--	12.6	--	7.2	--	4.6	--

*Relationship is statistically significant at the .05 level of probability.

[a]The farmers in the innovator and early adopter category were combined into one category and tested against those in the early majority category. The "F" ratios were ranked from highest to lowest for the 10 variables in order to aid evaluation of the differences.

[b]The coefficient of correlation was computed on the actual scores on the independent variables with the number of the 10 farm practices ever tried. All the independent variables were scored in a positive direction.

Table 4. [illegible] of the Statistical Variation of 10 Characteristics of 104 Ohio [illegible]s by Adopter Category

Characteristic	Coef. of Corr. "r"[b]	"F" Ratio Between Adopter Categories: Inn.-Early Adopt.[a] and Early Maj. Est. "F" Ratio	Rank of Ratios	Early Majority and Late Majority Est. "F" Ratio	Rank of Ratios	Late Majority and Laggard Est. "F" Ratio	Rank of Ratios
1. Gross farm income	.53*	Sign.	1	Sign.	1	N.S.	7
2. Adoption leadership	.32*	?	4	N.S.	10	Sign.	1
3. Agric. specialist contact	.22*	N.S.	10	N.S.	6	N.S.	9
4. Extension contact	.34*	?	5	N.S.	8	Sign.	4
5. PMWU's of farm	.46*	Sign.	2	N.S.	5	?	5
6. Formal organ. membership	.32*	Sign.	3	Sign.	4	Sign.	3
7. Education	.52*	?	6	Sign.	3	N.S.	8
8. Enterprise specialization	.42*	N.S.	7	Sign.	2	N.S.	10
9. No. farm mag.	.21*	N.S.	8	N.S.	9	N.S.	6
10. Age	-.32*	N.S.	9	N.S.	7	Sign.	2
No. sign. "F" ratios		3	-	4	-	4	-

[a]The data on the innovators and early adopters were combined into one category. The sample size of the new category was assumed to be 17, and it was also assumed that the data on the three innovators from the random sample of all farmers were at the means of all innovators.

[b]These are the actual coefficients between adoption scores and the characteristics as they were reported by Rogers based upon the sample of 104 farmers. It is felt that an error was made in computation or reporting of variable 8 on enterprise specialization; the coefficient seems too high.

For instance, gross farm income was $15,900 for early adopters and $8,700 for those in the early majority category. Statistically significant differences occurred between those in the early majority and late majority categories on gross farm income, formal organizational membership, years of education and enterprise specialization. Those in the early majority category had an average of 10.6 years education compared to 8.9 years for those in the late majority category. Statistically significant differences occurred between those in the late majority and laggard categories on adoption leadership, county Extension contact, formal organizational membership and age. The average age of laggards was 55 compared to 44 for those in the late majority category. Thus, while scale of farm operation was the major type of variable separating farmers at early adoption levels, social factors seem to be more important in separating farmers at later adoption levels. For instance, the least innovative one-half the farmers varied mostly from one another on items implying social isolation from peers and agents of change.

Data from the Wisconsin study also indicated much dissimilarity of where selected characteristics differentiated farmers to the greatest extent (Table 3). However, because of the larger sample size, many of the variables were statistically significant at all adoption levels. Overall, the differences were most pronounced at the early adoption level and least pronounced at the late adoption level. The "F" ratios were largest at the early adopter and early majority comparison on county Extension contact, gross farm income, formal organizational membership, agricultural specialist contact and milk production (Figure 2). The difference was particularly acute for personal county Extension agent contact, while in the Ohio study, the greatest difference in county Extension agent contact occurred at the late adoption level. Opinion leadership, agricultural training, formal organizational membership and age produced the largest "F" ratios at the middle

Figure 2. Summary of the Difference of 10 Variables Between Adopter Categories for 400 Wisconsin Dairy Farmers and Comparison to the Study of 104 Ohio Farmers

Summary of Differences from the Study of 400 Wisconsin Farmers	Summary of the Differences from Roger's Study of 104 Ohio Farmers
Characteristic with the greatest difference at Inn.-early Adopter and Early Majority level	
1. County Extension agent contact (29.7* - 3.5 - 2.2)[a]	The only significant difference occurred at the LM and Laggard level although some difference occurred at the Inn.-EA and EM level
2. Gross farm income (24.0* - 4.5* - 9.1*)	Significant differences occurred at the Inn.-EA and EM level and the EM and LM level
3. Formal organizational membership (18.9* - 4.2* - 2.7)	Significant differences occurred at all three levels
4. Agricultural specialist contact (13.7* - 8.7* - 5.3*)	No significant differences at any level
5. Milk production per cow (8.4* - 7.4* - 6.2*)	No comparable measure
Characteristic with largest difference at middle adoption level	
1. Opinion leadership (9.2* - 14.6* - 3.5)	Only significant differences occurred at the LM and Laggard level
2. Agricultural training (10.3* - 11.8* - 4.9*)	No comparable measure
3. Formal education (6.9* - 8.0* - 1.4)	The only significant difference occurred at the EM and LM level although some difference occurred at the Inn.-EA and EM level
4. Age (0.1 - 4.8* - 0.2)	Only significant difference occurred at the LM and Laggard level
Characteristic with the largest difference at the LM and Laggard level	
1. Number of farm magazines (4.7* - 4.3* - 10.7*)	No significant differences at any level although the trend was similar on the differences which did occur

*Statistically significant "F" ratio at the .05 level of probability.

[a]The figures are the "F" ratios at the innovator-early adopter and early majority, early majority and late majority, and late majority and laggard combinations, respectively.

adoption level; some of the difference on the first three of these items may be attributed to the age difference. Age differences may have also accounted for a similar grouping of differences in the Ohio study, although in that case age difference was greatest at the late adoption comparison. In the Wisconsin study, only the number of farm magazines received produced a larger "F" ratio at the late adoption comparison than at earlier levels. Statistically significant differences occurred at all three levels on gross farm income, agricultural specialist contact, milk production per cow, years of agricultural training and number of farm magazines received. Significant differences on county Extension agent contact only occurred at the early adoption level while age differences only occurred at the middle adoption level.